REMARKS

Applicant respectfully requests reconsideration of the application in light of the above amendments and the following remarks. Claims 13-16 and 18-30 are currently pending.

The Office Action rejects the claims under 35 USC § 112. Applicant has amended claim 13 to address the comments in the Office Action in an effort to further prosecution. Applicant notes, however, that the claim clearly states that the nanoparticles are in the nonlinear optical material, and it is the incidence of the light on the volume of the nonlinear optical material (already defined as having the nanoparticles) that achieves the stated function. As to the argument that "up to 10 milliwatts" includes zero milliwatts, Applicant submits that there would not then be a beam. Regardless, Applicant expects the amended language to address the concerns under 35 USC § 112. Notice to this effect is respectfully requested.

Claim 13 was rejected under 35 USC § 102 over Hwang US20040161575 as evidenced by Arnone WO-00-75641 (with US6828558 as translation). In the present amendment, Claim 13 has been amended to recites the mask layer provides an effective aperture. Applicant respectfully submits that Hwang, with or without Arnone, does not teach or disclose the claimed invention. As stated in the prior amendment, Hwang does not describe the dielectric materials in the mask layer as comprising a non-linear optical material.

Applicant notes that the present Office action relies on the assertion that Hwang mentions ZnS, and that Arnone mentions that ZnS has non-linear properties. But, to excite the nonlinear properties of ZnS, however, higher laser intensity is needed than as envisioned in Applicant's optical disk invention. In Arnone's patent, ZnS functions as an emitter crystal to generate THz pulse when it is excited by a visible laser pulse. In this type of situation, it is common practice that femto-second (fs) or pico-second(ps) laser pulses are necessary in order to excite the nonlinearity of the emitter material. These pulses have intensity on the order of GW/cm^2. In a reference which Applicant is attaching herewith, Krauss et al., Femtosecond measurement of nonlinear absorption and refraction in CdS, ZnSe, and Zns," Applied Physics Letters, 65 (14), 3 October 2004, the nonlinearity of ZnS was measured and shown that about $1GW/cm^2$ intensity is needed to excite the nonlinearity of the ZnS at 610nm and about $50GW/cm^2$ intensity is needed at 780nm. In Hwang's case, as reported in paragraph [0040], Experiment example 1, increased

C/N was achieved when using only 4mW laser power (P) at wavelength (lambda) 635nm with numerical aperture (NA) 0.6. This corresponds to a laser intensity of about 0.36MW/cm^2 (calculated using P/(lambda/NA)^2). The laser intensity is at least 3 orders of magnitude smaller than the laser intensity needed to excite the nonlinearity of ZnS. That is, the claim elements taken together as a whole preclude the use of the ZnS in the mask layer to achieve the non-linear functionality regardless of non-linearity being possibly achievable under a different set of operating parameters in a different application.

In claim 13, the nonlinear property of the matrix material in the mask layer has active functionality, as described in Applicant's paragraphs [0011] and [0025]-[0028]. Changing the refractive index of the matrix material due to its nonlinear response to a laser beam enables the resonance of the nano-particles. Due to the nonlinear response, the effective beam size is reduced to gain an "aperture-like" benefit to achieve higher resolution; and the nano-particles additionally enable a local field enhancement (which improves the signal level).

Accordingly, Applicant respectfully the withdrawal of the rejection of claim 13 on Hwang as evidenced by Arnone.

Claim 13 was rejected under 35 USC § 102 as anticipated by Nomura 1 as evidenced by Yamamoto. Applicant respectfully submits that Nomura 1 as evidenced by Yamamoto does not teach or disclose the above claim 13 recitations.

As stated in the prior amendment, Nomura 1 does not describe the dielectric materials in the mask layer as comprising a non-linear optical material. Applicant notes that the present Office action asserts that Nomura mentions SiO_2 and that Yamamoto mentions that SiO_2 has non-linear properties. But, that the material is non-linear doesn't mean that it is the SiO_2 in the material that causes it to be so. In fact, Claim 1, from which claim 5 of Yamamoto depends, recites "a nonlinear optical thin film comprising an amorphous alloy or a mixture of said amorphous alloy and an oxide glass component and ..." – thus clearly indicating that the nonlinear functional component in this thin film is the amorphous alloy.

Regardless of Yamamoto's description, whether SiO_2 has nonlinear optical properties under some circumstances is different from whether the nonlinear properties of SiO_2 are utilized and relevant to optical disks or the phenomena reported in Nomura 1. Nomura 1 states that "Signal intensity of very small marks was increased by metal nanoparticles ..." and the

discussions on Nomura 1 page 1878 indicate "the size or density of Ag particles influenced the extent of enhancement". The SiO_2 component is not related to the signal enhancement effect described in Nomura 1. Nonlinear response of SiO_2 has been reported when excited by femto-second (fs) laser pulses. However, it requires laser intensity on the order of about $0.05\text{-}1\times10^{15}$ W/cm^2 to excite the nonlinear response. The experiments described in Nomura 1 used 635nm beam, 0.6NA, 1-4mW power with a light intensity of less than 10^6 W/cm^2. This is 8 orders of magnitude smaller than the intensity needed to excite the nonlinearity of SiO_2. Therefore, the phenomena described in Nomura 1 appears to have nothing to do with nonlinearity of SiO_2 in the dielectric layer.

Accordingly, Applicant respectfully the withdrawal of the rejection of claim 13 on Nomura 1 as evidenced by Yamamoto.

Claims 13-15, 20, 23-24 were rejected under 35 USC § 102 as being anticipated by Nomura JP2002133720 (Nomura 2) in view of Yamamoto. With respect to claim 13, the above discussion of non-linear materials and SiO_2 is the same for this rejection. Claims 14-15, 20, and 23-24 depend from claim 13. Accordingly, Applicant respectfully requests the withdrawal of the rejection on Nomura 2 of claim 13, as well as claims 14-15, 20, and 23-24 which depend therefrom.

Claims 13, 19-20, and 22 were rejected under 35 USC § 102 as being anticipated by Iida. With respect to claim 13, as stated in Applicant's prior amendment, in Iida, the semiconductor nanoparticles are not embedded into a nonlinear optical material (instead the particles appear to be added to the mask material to create the non-linearity) and are not described relative to increasing local field intensity.

More specifically, in Iida, a shutter layer was designed to tighten an irradiated beam. Dispersing semiconductor fine particles into a matrix of glass or resins forms the shutter layer. The amount of the semiconductor fine particles is 1–80mol% (3/21-23) with higher amounts resulting in particle condensation and lower amounts providing less shutter effect (3/24-30). The shutter effect in Iida is provided by the semiconductor nano-particles not by the glass or resin matrix. As stated in column 3, lines 34-35, the matrix is for dispersing the semiconductor fine particles. Iida further states that the nonlinear optical effect is produced by the quantum state ("exciton") of the semiconductor fine particles (column 4, lines 15-26). Therefore, the glass or

organic resin options recited by Iida do not provide the nonlinear optical properties and neither of them is intended in Iida's patent to be used as a nonlinear material. It is the additional particles that result in the non-linearity. The claims, as amended, are not disclosed, taught or reasonably suggested by the cited reference. Accordingly, Applicant respectfully requests the withdrawal of the rejection over Iida.

Claims 13, 16 and 19 were rejected under 35 USC § 103 over Hsu in view of Hwang, Nomura 1, or Nomura 2. The Office Action states that Hsu does not teach a mask layer comprising nanoparticles embedded in a non-linear optical material. As discussed above, Applicant also submits that none of Hwang, Nomura 1, or Nomura 2 teach the claim elements relating to the non-linear recitations either. The Office action then states that silver oxide is a non-linear material.

The Office Action more specifically recites:

> Hwang ..., Nomura [2], and Nomura [1] all teach a mask layer containing nanoparticles embedded in a non-linear optical material. Silver oxide is a non-linear optical material.
>
> It would have been obvious to one of ordinary skill in the art to modify the super-resolution recordable optical disk taught by Hsu et at. by using the mask layers taught by any of Hwang ..., Nomura [1], or Nomura [2], comprising metal nanoparticles embedded in a non-linear optical material with the reasonable expectation of forming an optical recording medium in which the size of the particles in the mask layer can be controlled (Nomura [2] (0005)] and in which capable of high-density recording below the diffraction limit (Nomura [1]) and Hwang ...).

Therefore, even if the particles of Hwang, Nomura 1, or Nomura 2 were added within the embodiment of Hsu, the elements of Applicant's claim 13 would not be taught or suggested. Amended claim 13 is not taught or reasonably suggested by Hsu does with respect to the non-linear material.

Accordingly, Applicant respectfully requests the withdrawal of the obviousness rejection of claim 13, and claims 16-19 that depend therefrom.

Claim 18 was rejected under 35 USC § 103 over Hsu in view of any of Hwang, Nomura 1, or Nomura 2 and further in view of Fuji, "A near-field recording and readout technology using a metallic probe in an optical disk,"; claim 21 was rejected on Iida and Kim; claims 25 and 28-30 were rejected Nomura 2 as evidenced by Yamamoto in view of Perry, and claims 26-27 were

rejected on Nomura 2 as evidenced by Yamamoto in view of Sonnichsen. These pending claims depend from allowable claim 13 and are allowable for at least that reason.

With specific reference to claim 21, Iida uses the semiconductor particles to create non-linearity. There does not appear to be any suggestion that such particles would have any purpose or role in a system where a mask material is inherently nonlinear. Thus Applicant traverses the statement on page 10 of the Office Action that it would be obvious to modify the layer of Iida with the non-linear material of Kim.

Applicant respectfully requests that a timely Notice of Allowance be issued in this case. Should the Examiner believe that anything further is needed to place the application in better condition for allowance, the Examiner is requested to contact Applicant's undersigned representative at the telephone number below.

Respectfully submitted,

/Shawn A. McClintic/
Shawn A. McClintic
Reg. No. 45,856
General Electric Company
Building K1, Room 3A69
Niskayuna, New York 12309
Telephone: (518) 387-5448

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